

WHAT IS CLAIMED IS:

1. A modular hip prosthesis, comprising:

a proximal segment, said proximal segment including a neck lockingly engageable with a femoral head component, said proximal segment further including a male tapered portion extending distally of said neck;

a distal segment having a proximal end and a distal tip, said distal segment including a male tapered portion adjacent said proximal end thereof;

a metaphyseal segment having a proximal end and a distal end, said metaphyseal segment including a bone engaging outer surface portion, said metaphyseal segment further including an axial bore therethrough, said axial bore including first and second female tapered portions, said first female tapered portion located adjacent to said proximal end of said metaphyseal segment and dimensionally configured to lockingly engage said male tapered portion of said proximal segment, said second female tapered portion located adjacent to said distal end of said metaphyseal segment and dimensionally configured to lockingly engage said male tapered portion of said distal segment.

2. The modular hip prosthesis of claim 1, wherein said proximal segment further

includes an axial bore therethrough, said proximal segment engageable with said proximal end of said metaphyseal segment to align said axial bores formed through said proximal and metaphyseal segments, said distal segment further including a threaded axial bore adjacent said proximal end thereof, said proximal end of said distal segment engageable with said distal end of said metaphyseal segment to align said axial bores formed through said distal and metaphyseal

segments, said modular hip prosthesis further comprising a screw dimensionally configured to pass through said aligned bores of said proximal, metaphyseal and distal segments and into threaded engagement with said threaded axial bore of said distal segment.

5       3.     The modular hip prosthesis of claim 1, wherein said distal segment includes a bone engaging outer surface portion.

10      4.     The modular hip prosthesis of claim 3, wherein said bone engaging surface of said distal segment comprises longitudinal flutes formed along an incremental length thereof.

15      5.     The modular hip prosthesis of claim 1, wherein said distal segment further comprises a coronal slot along an incremental length thereof.

20      6.     The modular hip prosthesis of claim 3, wherein said bone engaging surface of said distal segment is selected from the group consisting of a grit blasted surface, sintered metal bead coating, hydroxylapatite coating, plasma spray coating, bio-glass ceramic coating, demineralized bone and carrier, and growth factor and carrier.

25      7.     The modular hip prosthesis of claim 1, wherein said distal segment has a generally circular transverse cross section.

30      8.     The modular hip prosthesis of claim 1, wherein the distal tip of said distal

segment has a generally parabolic axial cross section.

9. The modular hip prosthesis of claim 1, wherein said distal segment is constructed from a material selected from the group consisting of a titanium metal alloy, cobalt chromium alloy, and stainless steel.

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10. The modular hip prosthesis of claim 1, wherein said male tapered portion of said distal segment and said second female tapered portion of said metaphyseal segment each comprise a conical tapered section blending into a generally parabolic section.

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15. The modular hip prosthesis of claim 10, wherein the ratio of parabolic taper length to conical taper length ranges from about 5% to about 30%.

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12. The modular hip prosthesis of claim 11, wherein the taper angle of said conical tapered sections of said distal segment and said second female tapered portion of said metaphyseal segment ranges from about 1° to about 2.5°.

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13. The modular hip prosthesis of claim 1, wherein said male tapered section of said proximal segment is formed on an extension member extending distally of said neck.

14. The modular hip prosthesis of claim 13, wherein said extension member includes a nipple member extending distally thereof.

15. The modular hip prosthesis of claim 1, wherein said male tapered portion of said proximal segment and said first female tapered portion of said metaphyseal segment each comprise a conical tapered section blending into a generally parabolic section.

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16. The modular hip prosthesis of claim 15, wherein the ratio of parabolic taper length to conical taper length ranges from about 5% to about 30%.

10 17. The modular hip prosthesis of claim 16, wherein the taper angle of said conical tapered sections of said proximal segment and said first female tapered portion of said

metaphyseal segment ranges from about  $1^\circ$  to about  $2.5^\circ$ .

15 18. The modular hip prosthesis of claim 1, wherein said proximal segment is

constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

20 19. The modular hip prosthesis of claim 1, wherein the bone engaging surface of said metaphyseal segment is selected from the group consisting of grit blasted finish, sintered metal bead coating, hydroxylapatite coating, plasma spray coating, bio-glass ceramic coating, demineralized bone and carrier, and growth factor and carrier.

20. The modular hip prosthesis of claim 1, wherein said metaphyseal segment is

constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

21. The modular hip prosthesis of claim 1, wherein said metaphyseal segment has a trapezoidal truncated pyramidal section integrated with a generally conical section.

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22. The modular hip prosthesis of claim 21, wherein said metaphyseal segment has a generally trapezoidal transverse cross section offset from a generally circular transverse cross section.

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23. The modular hip prosthesis of claim 21, wherein said metaphyseal segment includes an outer ring formed around at least a portion of said generally conical section.

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24. A modular hip prosthesis, comprising:

a proximal segment, said proximal segment including a neck lockingly engageable with a femoral head component, said proximal segment further including a male tapered portion extending distally of said neck;

a distal segment having a proximal end and a distal tip, said distal segment including a male tapered portion adjacent to said proximal end thereof and a bone engaging outer surface portion; and

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a metaphyseal segment having a proximal end and a distal end, said metaphyseal segment further including an axial bore therethrough, said axial bore including first and second

female tapered portions, said first female tapered portion located adjacent to said proximal end of said metaphyseal segment and dimensionally configured to lockingly engage said male tapered portion of said proximal segment, said second female tapered portion located adjacent to said distal end of said metaphyseal segment and dimensionally configured to lockingly engage said male tapered portion of said distal segment.

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25. The modular hip prosthesis of claim 24, wherein said proximal segment further includes an axial bore therethrough, said proximal segment engageable with said proximal end of said metaphyseal segment to align said axial bores formed through said proximal and metaphyseal segments, said distal segment further including a threaded axial bore adjacent said proximal end thereof, said proximal end of said distal segment engageable with said distal end of said metaphyseal segment to align said axial bores formed through said distal and metaphyseal segments, said modular hip prosthesis further comprising a screw dimensionally configured to pass through said aligned bores of said proximal, metaphyseal and distal segments and into threaded engagement with said threaded axial bore of said distal segment.

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26. The modular hip prosthesis of claim 24, wherein said male tapered portion of said proximal segment and said first female tapered portion of said metaphyseal segment each comprise a conical tapered section blending into a generally parabolic section.

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27. The modular hip prosthesis of claim 26, wherein the ratio of parabolic taper length to conical taper length ranges from about 5% to about 30%.

28. The modular hip prosthesis of claim 27, wherein the taper angle of the conical tapered sections of said proximal segment and said first female tapered portion of said metaphyseal segment ranges from about 1° to about 2.5°.

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29. The modular hip prosthesis of claim 24, wherein said proximal segment is constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

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30. The modular hip prosthesis of claim 24, wherein said male tapered portion of said proximal segment is formed on an extension member extending distally of said neck.

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31. The modular hip prosthesis of claim 30, wherein said extension member includes a nipple member extending distally thereof.

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32. The modular hip prosthesis of claim 24, wherein said distal segment has a generally circular transverse cross section.

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33. The modular hip prosthesis of claim 24, wherein said male tapered portion of said distal segment and said second female tapered portion of said metaphyseal segment each comprise a conical tapered section blending into a generally parabolic section.

34. The modular hip prosthesis of claim 33, wherein the ratio of parabolic taper length to conical taper length ranges from about 5% to about 30%.

5 35. The modular hip prosthesis of claim 34, wherein the taper angle of said conical sections of said distal segment and said second female tapered portion of said metaphyseal

segment ranges from about 1° to about 2.5°.

10 36. The modular hip prosthesis of claim 24, wherein said bone engaging surface of said distal segment comprises longitudinal flutes formed along an incremental length thereof.

15 37. The modular hip prosthesis of claim 24, wherein said distal segment further comprises a coronal slot along an incremental length thereof.

38. The modular hip prosthesis of claim 24, wherein said bone engaging surface of said distal segment is selected from the group consisting of grit blasted surface, sintered metal bead coating, hydroxylapatite coating, plasma spray coating, bio-glass ceramic coating, demineralized bone and carrier, and growth factor and carrier.

20 39. The modular hip prosthesis of claim 24, wherein said distal segment is constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

40. The modular hip prosthesis of claim 24, wherein said metaphyseal segment includes a bone engaging outer surface selected from the group consisting of a grit blasted surface, sintered metal bead coating, hydroxylapatite coating, plasma spray coating, bio-glass ceramic coating, demineralized bone and carrier, and growth factor and carrier.

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41. The modular hip prosthesis of claim 24, wherein said metaphyseal segment has a trapezoidal truncated pyramidal section integrated with a generally conical section.

10 42. The modular hip prosthesis of claim 41, wherein said metaphyseal segment has a generally trapezoidal transverse cross section offset from a generally circular transverse cross section.

15 43. The modular hip prosthesis of claim 41, wherein said metaphyseal segment includes an outer ring formed around at least a portion of said generally conical section.

44. The modular hip prosthesis of claim 24, wherein said metaphyseal segment is constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

20 45. A modular hip prosthesis, comprising:  
a proximal segment having an axial bore therethrough, said proximal segment including a neck lockingly engageable with a femoral head component, said proximal segment

1 further including a male tapered portion extending distally of said neck;

2 a distal segment having a proximal end and a distal tip, said distal segment formed  
3 with a threaded axial bore adjacent to said proximal end thereof, said distal segment further  
4 formed with a male tapered portion adjacent said proximal end thereof;

5 a metaphyseal segment having a proximal end and a distal end, said metaphyseal  
6 segment including a bone engaging outer surface portion, said metaphyseal segment further  
7 including an axial bore therethrough, said axial bore including first and second female tapered  
8 portions, said first female tapered section located adjacent said proximal end of said metaphyseal  
9 segment and dimensionally configured to lockingly engage said male tapered portion of said  
10 proximal segment, said second female tapered portion located adjacent said distal end of said  
11 metaphyseal segment and dimensionally configured to lockingly engage said male tapered  
12 section of said distal segment; and

13 said proximal segment engageable with said proximal end of said metaphyseal  
14 segment to align said axial bores formed through said proximal and metaphyseal segments, said  
15 proximal end of said distal segment engageable with said distal end of said metaphyseal segment  
16 to align said axial bores formed through said distal and metaphyseal segments; and

17 said modular hip prosthesis further comprising a screw dimensionally configured  
18 to pass through said aligned bores of said proximal, metaphyseal and distal segments and into  
19 threaded engagement with said threaded axial bore of said distal segment.

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21 46. The modular hip prosthesis of claim 45, wherein said male tapered portion of said  
22 proximal segment and said first female tapered portion of said metaphyseal segment each

comprise a conical tapered section blending into a generally parabolic section.

47. The modular hip prosthesis of claim 46, wherein the ratio of parabolic taper length to conical taper length ranges from about 5% to about 30%.

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48. The modular hip prosthesis of claim 47, wherein the taper angle of said conical sections of said proximal segment and said first female tapered portion of said metaphyseal segment ranges from about 1° to about 2.5°.

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49. The modular hip prosthesis of claim 45, wherein said proximal segment is constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

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50. The modular hip prosthesis of claim 45, wherein said male tapered portion of said proximal segment is formed on an extension member extending distally of said neck.

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51. The modular his prostheses of claim 45, wherein said extension member includes a nipple member extending distally thereof.

52. The modular hips prosthesis of claim 45, wherein said distal segment further includes longitudinal flutes along an incremental length thereof.

53. The modular hip prosthesis of claim 45, wherein said distal segment further includes a coronal slot formed along an incremental length thereof.

5 54. The modular hip prosthesis of claim 45, wherein said male tapered portion of said distal segment and said second female tapered portion of said metaphyseal segment each

comprise a conical tapered section blending into a generally parabolic section.

10 55. The modular hip prosthesis of claim 54, wherein the ratio of parabolic taper length to conical taper length ranges from about 5% to about 30%.

56. The modular hip prosthesis of claim 55, wherein the taper angle of said conical tapered sections of said distal segment and said second female tapered section of said metaphyseal segment ranges from about 1° to about 2.5°.

15 57. The modular hip prosthesis of claim 45, wherein said distal segment is constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.

20 58. The modular hip prosthesis of claim 45, wherein said distal segment includes a bone engaging outer surface selected from the group consisting of grit blasted surface, sintered metal bead coating, hydroxylapatite coating, plasma spray coating, bio-glass ceramic coating, demineralized bone and carrier, and growth factor and carrier.

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59. The modular his prosthesis of claim 45, wherein said metaphyseal segment has a trapezoidal truncated section integrated with a generally conical section.

5 60. The modular hip prosthesis of claim 59, wherein said metaphyseal segment has a generally trapezoidal transverse cross section offset from a generally circular cross section.

10 61. The modular hip prostheses of claim 59, wherein said metaphyseal segment includes an outer ring formed around at least a portion of said generally conical section.

15 62. The modular hip prosthesis of claim 45, wherein said bone engaging surface of said metaphyseal segment is selected from the group consisting of grit blasted surface, sintered metal bead coating, hydroxylapatite coating, plasma spray coating, bio-glass ceramic coating, demineralized bone and carrier, and growth factor and carrier.

63. The modular hip prosthesis of claim 45, wherein said metaphyseal segment is constructed from a material selected from the group consisting of titanium metal alloy, cobalt chromium alloy, and stainless steel.